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Paola Brighi*
Valeria Venturelli**

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* Department of Management, University of Bologna and CEFIN - Centro Studi Banca e Finanza, Via Angherà 22, 47921 Rimini

**University of Modena, Address: Department of Economics Marco Biagi and CEFIN - Centro Studi Banca e Finanza, Viale Berengario, 51, I-41121 Modena, Italy - Phone: 39 059 2056874 e-mail: valeria.venturelli@unimore.it

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Dipartimento di Economia Marco Biagi
Università degli studi di Modena e Reggio Emilia
Via Berengario 51 | 41121 Modena
tel. 059 2056711 | fax. 059 2056937
info.economia@unimore.it | www.economia.unimore.it

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Paola Brighi

Department of Management, University of Bologna and CEFIN - Centro Studi Banca e Finanza

Via Angherà 22

47921 Rimini

Valeria Venturelli[1]

Department of Economics Marco Biagi, University of Modena and Reggio Emilia and CEFIN - Centro Studi Banca e Finanza

Viale Berengario 51

41121 Modena

ABSTRACT

This paper investigates whether the range of activities conducted by banks influences their performance and risk. Using an unbalanced panel dataset which includes 308 bank-year observations, for the period 2006-2011, corresponding to 52 Italian Bank Holding Companies in the last year, the core question is to analyse the effect of diversification across and within both traditional and non-traditional income and if the results have been affected by the financial crisis. The main results suggest that revenue diversification plays a role in determining bank performance. The relative effects appear, however, to be different in relation to banks' size and capital ratio. The results have strategic implications both for bank managers, regulators and supervisors for the consequences on banks' performance and stability.

JEL classification: G21

Keywords: Income diversification, Risk, Performance, Capital ratio, Panel data

[1] Corresponding author.

1. Introduction

The paper addresses the question of diversification in the banking sector. The transformation of European banking systems in the last three decades has been intense and strictly related to the effects of deregulation and innovation on the competitive environment. The deregulation process has largely been based on the view that income diversification reduces the volatility of bank earnings and makes banks more resilient to financial distress. After the financial crisis, the argument gains ground that the banking industry should be less diversified and refocused on lending activities (Vallascas et al., 2012).

Theoretically, the literature on bank diversification primary rests on the assumption that diversification may lead to cost savings or revenue improvements due to spreading of fixed costs, economies of scope from using the same information, customer cost economies (Berger et al, 1987). Second banks may also reduce their risks by engaging in a wide range of activities exploiting the diversification benefit (Diamond, 1984) and by reducing the agency costs of managerial discretion by lowering cash-flow volatility (Stulz, 1990; Amihud and Lev, 1981).

As in previous studies, rather than attempting to measure economies of scope and agency problems directly, we investigate whether the range of activities conducted by banks influences their performance and risk. This is particularly interesting given the turmoil period investigated; in fact, this argument gains ground given the on-going debates as to what the scope of bank activities should be.

The research questions are addressed to evaluate the relationship between diversification and performance taking into account also the diversification effects between different business lines. This represents one of the novelties of the paper; in fact, with respect to the previous work on bank diversification, our paper represents the first attempt to directly assess the risk/return implications of different types of product mixes through the splitting of non-traditional revenues into different components. Furthermore, in our study we analyse whether certain type of institutions are better able to reap the benefits of diversification analysing performance implications for different categories of banks. In this respect our analysis deserves interesting new issues taking into account the interactive effect between non-traditional bank activities, bank size and its capitalization degree. Moreover, we use data at the bank individual level using consolidated balanche sheet when available and unconsolidated if not; this choice is of particular importance for several reasons the principal one linked to the fact that banks tend to reserve the making of non traditional innovative activities to non-banking subsidiaries whose contribution can be more precisely evaluate if consolidated financial statements are available.

The main results suggest that revenue diversification plays a role in determining bank performance. The relative effects appear, however, to be different in relation to banks' size and capital ratio.

To evaluate the robustness of our results, we perform several robustness checks, considering measurement issues and controlling for potential endogeneity and selectivity problems between bank performance and diversification.

The paper is structured as follows. Section 2 reviews the theoretical and empirical literature on the nexus between both type of diversification and bank performance. Section 3 presents the econometric methodology and the data used. Section 4 describes the results and discusses the robustness. Finally, Section 5 concludes.

2. Literature Review

Theoretically, the literature on bank diversification analyses the benefit and costs associated to the strategy developed. Among the former are the results of the portfolio theory that postulate that as long as the revenue streams from different financial activities are less than perfectly correlated, income diversification should offer banks opportunities to grow their risk-adjusted profits. Thanks to economies of scope, diversification may lead to an increase in performance through cost savings or revenue improvements due

to the joint production of a wide range of financial services (Teece, 1980 and 1982; Llewellyn, 1996; Klein and Saidenberg, 1997); moreover, diversified banks should realize revenue efficiencies when cross-selling various (fee-based) financial products alongside traditional lending-based services (Herring e Santomero, 1990). Given information asymmetry, banks gain valuable information on their clients by providing a service that might grant advantages in the provision of other services (Diamond, 1984; Rajan, 1992; Saunders and Walter, 1994; Stein, 2002). Finally, for some agency theories diversification reduces the agency costs of managerial discretion by lowering cash-flow volatility (Stulz, 1990; Amihud and Lev, 1981) or by creating internal capital markets (Stein, 1997; Gertner et al. 1994).

Alongside the positive effects, adverse implications on performance have been identified. Diversification can intensify agency problems between corporate insiders and small shareholders making it more difficult to design efficient managerial incentive contracts and more difficult to align the incentives of outsiders with insiders (Aron, 1988; Stulz, 1990; Rotemberg and Saloner, 1994). Increasing the size and scope of a bank's activities introduces the "cost of complexity", which at some point may dominate the benefits that can be achieved (Rajan et al, 2000); diversified banks can use their advantage to operate with greater leverage, since several fee-based activities can be performed holding little or no regulatory capital, and to pursue riskier lending (Demsetz and Strahan, 1997; DeYoung and Roland, 2001). Diversified institutions can be characterized by volatile earnings (i.e.: investment banking activities), lower switching costs for clients (i.e.: non-traditional banking services are based on transaction-based bank-client relationships) and higher operational leverage (given the heavy fixed investments in technology and human resources required) increasing in this way volatility of earnings and hampering risk adjusted performance measures.

Despite extensive research on the economic consequences of diversification, the empirical literature does not provide clear evidence on whether diversification generates net benefits or costs; this could be linked to the fact that it is extraordinarily difficult to unequivocally measure economies of scope or agency problems empirically. Given this, a more recent strand of empirical literature rather than attempting to measure economies of scope and agency problems directly, investigate whether the range of activities conducted by financial institutions influences their performance.

The empirical analysis centred on the profile of the diversification between interest and non-interest bearing activities has largely concerned the US banking system following the implementation in 1999 of Gramm Leach Bliely Act (also known as Financial Services Modernisation Act) that abolished part of the Glass Steagal Act of 1933, allowing for the consolidation between investment bank, commercial bank and insurance companies.

With few exceptions[2] the results conclude that the costs of diversification outweigh the benefits (Stiroh, 2004a,b; Stiroh and Rumble, 2006; Laeven and Levine, 2007; Goddard et al. (2008)) and the result is valid both for financial holding companies and smaller institutions such as credit unions.

Fewer studies deal with European banks. Among them, Mercieca et al. (2007) explores the economic impact of diversification on average profitability by calculating the effect of an increase in the non-interest share on a sample of 755 small European banks for the period 1997–2003. The analysis evidences that an increase in non-interest activities has two main effects, that are a direct impact from shifting into non-interest activities and, an indirect effect arising from changes in diversification. Moreover, a negative net effects for average profitability and a corresponding positive effects on volatility are detected. The results are robust with respect to several controls, suggesting that over the investigated period the higher volatility of net-interest income outweighs diversification benefits. Lepetit et al. (2008) focusing on the relationship between bank risk and product diversification for a set of European banks belonging to 14 countries during the period 1996-2012 find that a shift into non-interest activities involves higher risk and this is particular true for smaller banks and driven by commission and fee activities.

Turning to the Italian situations, Acharya et al. (2006) analyse the relationship between industrial loan diversification and performance using data from 105 Italian banks over the period 1993-1999 concluding that diversification of bank assets is not guaranteed to produce superior performance and/or greater safety

[2] See Stiroh (2009) for a recent review of the literature

for banks. Chiorazzo et al. (2008) using annual data from 85 Italian banks over the period 1993–2003 find that income diversification increases risk-adjusted returns and that diversification gains diminish with bank size. Cotugno and Stefanelli (2012) using a panel dataset comprising 4038 observations relative to Italian banks for the period 2005-2010 find a positive relationship between product diversification and bank performance also in terms of risk adjusted measures. Vallascas et al. (2012) on a sample of 145 Italian banks during the period 2006-2008, verifies that diversification benefits depend on the type of activities developed. They verify that banks that were diversified within narrow activity classes before the crisis experienced large declines in performance during the financial crisis. By contrast, diversification across broad activity classes, such as lending and capital market activities, did not cause performance losses during the crisis.

Following the above literature in the paper, we consider the effects of revenue diversification on performance. The aim is to investigate whether, and to what extent, bank propensity toward non-interest income affects some principal risk adjusted performance measures. In particular, the principal hypotheses to be tested in the remainder of the paper are the following:

H1 – the existence of a positive relationship between performance and diversification between traditional and non-traditional revenue bearing activities;

H2 – the evidence of a positive relationship between performance and diversification between traditional and the individual components of non-traditional revenue bearing activities;

H3 - verify if larger or more capitalized institutions are better able to reap the benefits of diversification strategies in terms of increased performance.

With respect to the previous work on bank diversification, our paper represents the first attempt to directly assess the risk/return implications of different types of product mixes. Non traditional revenues are in fact split into different components. Second a large amount of additional explanatory variables have been included in the model in order to avoid potential omitted variables bias. Finally, we consider a large set of diversification and risk adjusted performance measures at the bank individual level using consolidated balanche sheet when available and unconsolidated if not. This latter choice is of particular importance for at least three reasons: first, banks tend to reserve the making of non traditional innovative activities to non-banking subsidiaries whose contribution can be more precisely evaluate if consolidated financial statements are available; then, diversification benefits may exist for the institution as a whole and not for the single subsidiary; finally, from a regulatory point of view it is imporant to evaluate the single bank holding company because it is the relevant unit to take into account in case of systemic risk (Stiroh and Rumble, 2006).

3. Variables definition and methodology

3.1. Measure of banks' revenue diversification

To determine the degree of bank diversification asset-based measure and/or income-based indicator can be used. Ideally to measure the diversification of bank activities, detailed data on the degree to which each bank underwrites, operates mutual funds, insurance, etc. should be used. The dataset available do not provide this kind of information, so, several authors, construct revenue based measure. Traditionally in literature (Stiroh, 2004a,b; Lepetit et al., 2008) one way to capture the degree of diversification of bank activities is to consider the net interest income generated by traditional activities and non-interest income produced by non-traditional ones. These revenue based measures suffer from larger measurement problems than the asset-based measure (Laeven and Levine 2007). In fact, loans and in general more traditional activities can yield fee income; in this way the income-based measure could overestimate the degree to which some lending institutions engage in non-lending activities. For instance, DeYoung and Rice

(2004) show that payment services linked to the traditional banking activities are the largest source of non-interest income for U.S. banks.

To mitigate the overestimation problem, we disaggregate fee income in relation to the type of activity developed. In particular, as in Vallascas et al. (2012), we divide gross commission revenue along four principal dimensions; the first three identify a productive diversification profile while the last one a distributive diversification strategy followed by the banks in the sample. The four categories are Traditional Banking Commission (TBC) that comprises commission income from guarantees given, collection and payment services, services related to factoring, tax collection services, current accounts management and other services; Market and Trading Commission (MKT) fee and commission revenue from credit derivatives, trading operations in financial instruments and foreign exchange, custody and administration of securities, underwriting operations, servicing related to securitization, placement of securities, multilateral trading facilities management, financial structure consultancy service; Asset management commission (AM) from portfolio management services, depositary bank services and investment consultancy service; Fee based revenues from the distribution of third party products and services (DIS).

In line with our research questions, we construct a measure of **diversification across different sources of income**. To this end, following Lepetit et al. (2008) we define several variables.

First, we consider the ratio of non traditional income on total operating revenues (NON_TOP). NON is the difference between total operating revenues and traditional income (TRADT). TRADT is the sum of gross interest revenue[3] and Traditional Banking Commission (TBC).

Second, we disaggregate our diversification measures to allow for deeper insights. We distinguish four components of non traditional income. The first one is MKT_TOP which is the sum of gross market and trading Commission (MKT_TOP) on total operating revenue, the second one is the share of asset management commission (AM_TOP), the third one is the fraction of fee based revenues from the distribution of third party products and services (DIS_TOP) and the last one is the ratio between the absolute values of net result from financial operations[4] and total operating revenue (OPFIN_TOP). Finally, TOP – total operating revenue - is the sum of the five components (TOP = TRADT+ MKT + AM + DIS + OPFIN).

These shares show how focused a bank holding company is on a particular non traditional activity.

Moreover, following DeYoung and Roland (2001), Elsas et al. (2010) and Vallascas et al.(2012) that argue that the use of gross revenues is preferable to net revenues because allocating expenses (especially interest expenses) to different lines of bank business is somewhat arbitrary and may lead to biased diversity measures, we use gross measures.

3.2. Risk adjusted performance measures

Two alternative proxies of bank performance are employed: the return on assets (ROA) defined as the ratio of net results from ordinary activity to total assets. To adjust this measure for risk (volatility), following Stiroh (2004a,b) and Chiorazzo et al. (2008) we compute the ratio between the annual return on asset and its standard deviation calculated over the entire sample period. Analytically:

$$SHROA_{i,t} = \frac{ROA_{i,t}}{\sigma ROA_i}$$

where $SHROA_{i,t}$ indicates ROA risk-adjusted returns, for the bank i in the year t.

[3] Gross interest revenues are computes as Interest and similar income - Interest and similar income on Financial assets held for trading - Interest and similar income on Hedging derivatives.

[4] OPFIN comprises net result from trading and hedging activities, plus profits from sale of activities and repurchase of liabilities and net results from financial assets and liabilities designated at fair value.

Finally as in Stiroh 2004a,b we introduce a measure of insolvency risk computed in terms of the Z-score. The Z-score measures the distance to default and is calculated as follows.

$$Z-score_{i,t}=\frac{\left(ROA_{i,t}+\frac{E_{i,t}}{TA_{i,t}}\right)}{\sigma\left(ROA_{i}\right)}$$

3.3. Control variables

The banking sector all around the world has experienced major transformations in its environment, resulting in significant impacts on its performance. Thereby, both external and internal factors have been affecting the profitability of banks over time. The internal determinants include bank-specific variables. The external variables reflect environmental variables that are expected to affect the profitability of financial institutions. This section describes the control variables that we use in the econometric model distinguish between bank specific and external determinants.

Bank specific determinants

To capture the effects of bank size we use the continuous variable SIZE which is equal to the ln (Total asset) – SIZE; to control for the potential nonlinear relationship between size and performance, as in Berger et al. (2010), we also include the squared term of ln (Total asset) – SIZE_SQ.

As a proxy for bank capital we use the equity to total asset ratio (E_TA).

To evaluate if the lending strategy affects risk-adjusted returns we use the variable LOAN, which is the ratio between total loans and bank assets (DeYoung and Rice, 2004a; Stiroh, 2004a, Chiorazzo et al., 2008). The sign of the relation between lending strategy and risk-adjusted return is positive if loans are more profitable than other earning assets.

To proxy bank's credit quality we use the ratio Non-performing loans over Total loans (NPL) and the ratio of loan loss provisions over total loans (LLP).The two indexes are a good proxy for a measure of ex-post and ex-ante credit risk.

To proxy for managers risk attitude, we insert the variable GROWTH computed as the growth rate of bank total asset. Risk-loving bank managers usually prefer fast growth to more stable profits (Stiroh, 2004a). GROWTH could be also interpreted as a control variable for growth-by-acquisition (Chiorazzo et al., 2008).

To measure the effect of efficiency on bank profitability we introduce in the analysis the cost income ratio (COST_INCOME) computed as the ratio between personnel expenses and other administrative expenses over intermediation margin.

To assess bank's liquidity we employ the ratio Loans over the sum of Deposits and bond [LTDB] computed dividing the banks total loans by its total deposits and bonds issued. If the ratio is too high, it means that banks might not have enough liquidity to cover any unforeseen fund requirements; if the ratio is too low, banks may not be earning as much as they could be. There are also some empirical studies indicating that more reliance on market funding corresponds to higher risk exposure on the asset side of the balance sheet (Demirgüc-Kunt and Huizinga, 2010 and Norden and Weber, 2010).

External determinants

In addition to the bank-specific variables described above, our analysis includes a set of macroeconomic and industry-specific characteristics.

As the demand for lending increases during cyclical upswings, we introduce a measure of the Real GDP growth rate. The GDP_INDEX measures the GDP growth rate calculated in respect to the i-bank, weighting the indicator at the province level with the ratio of branches in the province in respect to the total amount of branches of the i-bank. The procedure allows to take into account of the different impact that each macro-indicator has on the bank, in respect to the presence of that bank in that province. Analytically:

$$\text{GDP\_INDEX}_{\text{i}} = \sum_{z_p} \frac{\text{Branches}_{iz_p}}{\text{Branches}_{\text{i}}} * \left(\text{GDP\_RATE}\right)_i$$

where i refers to the bank and z_p to the province where the bank operates.

Finally, to catch the effect of the financial crisis a structural break dummy is introduced. To account for the consequences from financial crisis we insert a dummy variable equals to zero for the years 2006, 2007 and 2008 and equals to one otherwise.

3.4. Empirical methodology

We use the two econometric models shown to examine the link between diversification and the level and volatility of the banks' profitability. In particular, the first one is useful to test for H1, while the second for H2. These regressions use Y = [ROA, SHROA, Z-Score] as dependent variables:

$$y_{i,t} = \alpha_{i,t} + \beta_1 \text{NON\_TOP}_{i,t} + \sum_{s=2}^{12} \beta_s \lambda_{i,t} + \varepsilon_{i,t} \quad (1)$$

$$y_{i,t} = \alpha_{i,t} + \beta_1 \text{MKT\_TOP}_{i,t} + \beta_2 \text{AM\_TOP}_{i,t} + \beta_3 \text{DIS\_TOP}_{i,t} + \beta_4 \text{OPFIN\_TOP}_{i,t} + \sum_{s=5}^{15} \beta_s \lambda_{i,t} + \varepsilon_{i,t} \quad (2)$$

where *i* identifies the individual bank-observation belonging to the sample (*i = 1, 2, 3,...,308*); *t* expresses the time variable (*t = 2006,..., 2011*); βs are the parameters to be estimated, λ is a matrix of control variables. Both the constant and the error terms are also indicated in the model.

NON_TOP is the proportion of non traditional revenues (MKT, AM, DIS and OPFIN) over the total operating revenues, MKT_TOP is the proportion of market and trading commission, AM_TOP is the proportion of asset management commission, DIS_TOP is the proportion of thrid party products and services distributive commission and finally OPFIN_TOP is the proportion of net result of financial operations, all variables computed as the propotion over the total operating revenues.

In the first model, β1 denotes the effect on performance due to variations in the share of non traditional income share. In the second model, β1- β4 denotes the effect on performance due to variations in the share of the different types of non traditional revenues types -commision income and net results from financial operations. Positive values of β1- β4 show that increases in non traditional income share are associated with higher returns.

It is important to note that the regression coefficients on the individual component shares in the revenue shares measure the effect of a shift from the omitted category of the component share into an alternative since one component share has to be excluded to avoid perfect collinearity. Since the shares sum to one; the coefficient on the included shares shows the impact of a 0.01 change from the omitted share to the included ones. In our exercise, we omit the varbiale traditional revenues (TRADT); thus the coefficcients β1- β4 denotes the impact of a 0.01 change in the traditional revenues stream towards the non traditional revenue generating activities.

The other variables control for factors potentially affecting the level and volatility of profits.

To test for the third hypothesis - in the empirical analysis, both in equations 1 and 2, we use the product between the measures of diversification and size in order to evaluate the interaction between size and diversification strategies and the product with capital ratio in order to evaluate the interaction with the degree of capitalisation.

A list of the variable used is presented in Table 2.

[Table 1 around here]

4. Data and empirical results

4.1. Data and descriptive statistics

Bank-level data come from ABI Banking Data Set, which contains detailed financial information on Italian banks. We exclude banks with missing data on basic accounting variables, including assets, loans, deposits, equity, interest income, non-interest income and commission. Finally, we exclude extreme outliers, which we define as banks with all performance measures outside the first and 99th percentile. The analysis covers the period 2006-2011. The starting date is 2006 since for all the Italian banks accounting data based on IAS-IFRS start from that date. The final dataset includes 308 bank-year observations corresponding to 52 BHC in the last year.

Differently from DeYoung and Roland (2001), Chiorazzo et al. (2008) and Vallascas et al. (2012) we analyze the relationship between diversification strategies and bank performance using consolidated accounting data when available and unconsolidated otherwise.

In the analysis data on macro environmental variables, over the period 2006-2011, are also used. Information on GDP at the provincial level are provided by ISTAT and by Istituto Tagliacarne.

The coverage of our sample relative to the population of the whole Italian banking system is nearly 70 per cent in terms of number of banks while above 95 per cent in terms of total asset, and it is quite stable over the analysed period (Table 2).

Table 3 reports the descriptive statistics for our sample of Italian BHC. These BHC are quite varied with mean average asset of 49.9 billion and a range from 0.072 billion to 1,050 billion. As with the Italian banking system as a whole, this sample is dominated by a few large banks so the mean greatly exceed the median (49.9 vs. 7.1). On the performance side our sample includes both low and high performing BHCs. The mean ROA is 0.007, with a median of 0.007 and a range from -0.044 to +0.058. This variation is useful to identify the link between operating strategies and performance.

The differences in operating strategies can be infered from the revenue diversification measures. The average (mean) bank generated 77.5% of its revenues from traditional activities. Turning to the non-interest income revenues the majority is represented by results from financial operation (OPFIN) that contributes for nearly 30% to the formation of the non-interest income, followed by Asset Management (AM) fee and commission (nearly 28%), market (MKT) commission (24%) and finally distribution commissions (DIS) (18%).

Fee and commision more linked to traditional banking business (TBC) represents the 54.6% of total fee and commisisons aggregate; this result to testifies their relevance (Table 4). Therefore, if traditional banking commissions are added to gross interest income, they represent the 15.2% of the traditional income aggregate.

[Table 3 & 4 around here]

4.2. Multivariate Analysis

As for the first research question, H1 – the existence of a positive relationship between performance and diversification between traditional and non-traditional revenue bearing activities, the aim is to understand how and in which measure the non-traditional activities have contributed to the profitable strategies of the bank in terms of performance and risk (Table 5).

The main result is that the non-traditional revenue component (NON_TOP) impacts positively both on the profitability and on the risk-adjusted profitability. No statistical significative effect is evident with respect to the risk. This result is further investigated taking into account both the interactive effect with bank size and capitalization.

As for size, we find that if the bank increases its non-traditional revenue component as well as its size the profitability decreases but at the same time the risk-adjusted profitability increases because the risk decreases. A larger bank can invest more in the non-traditional segment because can account for a more strategic experience on these activities; in other words, the result could be connected to the fact that larger banks are better equipped to manage risk linked to non-interest income activities than smallest ones.

Finally controlling for the interactive effect with the capital ratio, we find that as the non-traditional activities as well as the capital ratio increase then both the profitability and the risk increase. Following the classical economic theory on bank capitalisation suggesting an inverse effect of capitalization on bank distress (e.g., Lehar, 2005; Posghosyan and Cihak, 2011) our results appear at least contradictory. Despite this, Porter and Chiou (2012) report empirical results that – coherently with ours – support the theory that banks respond to more capital by increasing the risk in their earning asset portfolios and off-balance-sheet activities.

As for the control variables results are coherent with the expected signs. The negative and statistical significant sign for the dummy break variable suggests that financial crisis, as expected, negatively impact bank performance and risk.

[Table 5 around here]

Turning to the second hypothesis to be tested, H2 – the evidence of a positive relationship between performance and diversification between traditional and the individual components of non-traditional revenue bearing activities, similarly to the previous analysis further controls have been proposed to better understand the interactive effects of the single non-traditional revenue with both the size and the capital ratio.

Starting from the basic models (Table 6, columns 1-4-7) we investigate the effects of the individual non-traditional component share on bank risk and profitability. Evidence suggests that asset management, distribution and results from financial operation components positively affect the bank return-on-asset (ROA). As for risk adjusted profitability (SHROA) also market component plays a positive and statistically significant role influencing the bank profitability dimension.

As for ROA, the introduction of the interactive effect with the size (Table 6, columns 2-5-8) doesn't substantially affect the previous results; however, when market, distribution and financial operation components increase as well as the size increase the profitability decreases suggesting the presence some diseconomies of scale. For the asset management component different result are detected. In terms of SHROA, the direct effect is negative however if the asset management component increases as well as the size the sign is simply reversed. Larger banks seem to better equipped to manage the asset management component. As for default risk, the single non-traditional components imply an increased risk; however if the market, asset management and distribution components increase as well as the size increase the risk appears to diminish. Once again this result suggests that larger banks are better organized to manage the risk associated to this type of activities.

Finally as for the interactive effect with the capital ratio (Table 6, columns 3-6-9) results appear particularly of interest when evaluated in relation to the probability of default. In this case, the single non-traditional components (MKT_TOP, AM_TOP and OPFIN_TOP) implies a decreasing risk for the bank. However if these activities increase as well as the capital ratio the result is reversed. Increasing the market, asset management, distribution and the results from financial operation components is riskier for banks more capitalized. Also this result is in line with the Porter and Chiou (2012) thesis suggesting more capital accompanied by increased investments in market activities may imply more bank risk. On the same point Berger et al. (2008) suggest banks with high earning volatility would likely hold more capital. In a nutshell, banks more volatile and more sensitive to risk would minimize their costs of financial distress by maintaining high capital ratios. On the other side it is important to consider also the effect of the bank size and the attitude towards diversification given that larger banks enjoy scale economies in risk management, have easier access to capital markets and the "too big to fail" option could exacerbate their risk attitude. In this respect our analysis deserves interesting new issues taking into account the interactive effect between non-traditional bank activities, bank size and its capitalization degree suggesting: i) larger bank size implies less risk in line with the economies of scale argument while increasing the non-traditional activity components implies more risk; however increasing the non-traditional components for large banks implies less risk, i.e. larger banks are better equipped to manage risk earning components. ii) as capital ratio increases the bank risk decrease in line with the mainstream regulation literature (see among others e.g., Lehar, 2005; Posghosyan and Cihak, 2011). Then, differently from the previous model the single non-traditional components decrease bank risk but if the bank exacerbate its non-traditional activity increasing also its capital ratio it suggests an increasing risk attitude.

As for the control variables results are in line with the expected signs. Also this further investigation confirms the negative impact of the financial turmoil in terms of risk and profitability.

[Table 6 around here]

4.3. Robustness check

In this section we investigate the likely impact of: - different measures of bank performance; - the endogeneity issue. In our opinion these are the principal reasons for the discrepancy among the results of the different studies reviewed and our contribution.

For a further investigation of the relationship between diversification and performance, first of all we introduce alternative measures of bank performance. Two are the alternative measures employed: the return on equity (ROE) which is the ratio of net profits to equity, and the risk adjusted return on equity (SHROE) computed as the ratio between annual return on equity , and its standard deviation calculated over the entire sample period. As can be seen in Table 6 our major empirical findings remain qualitatively unchanged: considering both a macro-diversification index or a more disaggregated non-traditional income components measure implies a positive effect on ROE also on a risk adjusted basis.

Our second robustness check is linked to the fat that our results, and indeed many previous studies, are subject to an endogeneity problem. Specifically, a finding that diversified banks are more profitable than non-diversified banks is not evidence per se that diversification fosters profitability. It could reflect a tendency for diversified banks to overperform their non-diversified counterparts prior to the diversification decision. If then the endogeneity of the diversification variable is controlled for, it is likely that any previously observed relationship between diversification and performance disappears.

Following Laeven and Levine (2007) and Elsas et al. (2010), we control for selectivity, i.e. the problem that the same characteristics which affect the decision to diversify affect a bank's performance. To this end, we estimate a Heckman (1979) treatment effects model by maximum likelihood. The model consists of one equation for the determinants of the performance measure, where a dummy variable indicates whether a

firm is diversified or not. The dummy equals one, if the ratio of non traditional income over total operating income exceeds 22.61%, i.e. the 75% quantile of the empirical distribution. The model comprises a simultaneous probit estimation, where the dummy for a diversified bank is explained by variables exogenous to performance measures. In our baseline specification (see Table 5), performance measures seem not to depend on the total asset growth and on the GDP index. However, it is obvious that total asset and local GDP growth represent two important strategic instruments for banks in order to manage their corporate portfolio and in this way the scope of the diversification strategy, in this sense we use the two variables as exogenous instruments.

Table 7 shows the results of these selectivity estimations. In column 1, we present estimation results based on ROA, in column 2 based on SHROA and finally in column 3 based on Z-Score. The coefficient estimates support our main results – diversification positively affects performance. Hence, our results are robust to selectivity as well.

5. Conclusions

This paper empirically investigates the effects that revenue diversification strategies play on bank performance for a sample of Italian BHCs during the 2006-2011 period.

The main results can be summarized as follow.

First of all, the diversification analysis suggests that considering both a macro-diversification index or a more disaggregated non-traditional income components measure implies a positive effect on performance also on a risk adjusted basis while no statistical effect is verified in terms of risk.

Then, the introduction of the first interactive term that captures bank performance in terms of the degree of diversification in relation to asset size, evidence suggests that if a bank increase diversification towards non traditional income increasing as well as its size the impact in terms of risk-adjusted profitability is positive. The result could be connected to the fact that larger banks are better equipped to manage risk linked to non-interest income activities.

As for the second inetractive term, the one that relates bank performance, diversification and degree of capitalisation, the main empirical results suggest that increasing the non-traditional components is riskier for banks more capitalized since more capital can be accompanied by increased investments in market activities may generate more bank vulnerability.

Our analysis takes also into account the financial crisis effect. Results, as expected, suggest that financial turmoil negatively impact bank performance and risk.

To conclude, our analysis deserves interesting new issues taking into account the interactive effect between non-traditional bank activities, bank size and its capitalization degree suggesting that larger banks are better equipped to manage risk earning components and that more diversified and capitalized bank are characterised by higher risk attitude.

These results imply important policy implications suggesting that the usual capitalisation rules adopted by regulators and addressed to increase bank capitalisation for stability reasons can be misleading suggesting the development of new alternative tools.

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Table 1 Variables names and definitions

Name	Definition
ROA	Net results from ordinary activity over total asset
SHROA	Annual ROA over its standard deviation calculated over the entire sample period
Z_SCORE	$Z-score_{i,t}=\frac{\left(ROA_{i,t}+\frac{E_{i,t}}{TA_{i,t}}\right)}{\sigma\left(ROA_{i,t}\right)}$
TRADT_TOP	Ratio of traditional income (Gross interest + Traditional Banking Commission) on total operating revenues
NON_TOP	Ratio of non traditional income on total operating revenues
MKT_TOP	Market and trading Commission on total operating revenue
AM_TOP	Share of asset management commission on total operating revenue
DIS_TOP	Ratio of fee based revenues from the distribution of third party products and services on total operating revenue
OPFIN_TOP	Net result from financial operations over total operating revenue
SIZE	Ln Total Asset
SIZE_SQ	(Ln Total Asset)^2
COST_INCOME	Personnel and other administrative expenses over intermediation margin
E_TA	Equity over Total Asset
LOAN	Total loans over total asset
GROWTH	Yearly growth rate in total asset
LTDB	Total loans over total deposits and bonds
NPL	Net non performing loans over net loans
LLP	Loan loss provisions over net loans
GDP_INDEX	$\text{GDP\_INDEX}_{\text{i}}=\frac{\sum_{z_p}\frac{\text{Branches}_{iz_p}}{\text{Branches}_{\text{i}}}*(\text{GDP\_RATE})_i}{P_i}$

Table 2 Sample coverage

	2006	2007	2008	2009	2010	2011
			Number			
BHC: sample	48	50	52	55	51	52
BHC: national total	87	82	81	75	76	77
Italian banks: national total^	579	585	576	565	552	551
BHC: sample coverage [%]	55.2	61.0	64.2	73.3	67.1	67.5
			Total assets (in bilions)			
BHC: sample	1,783	2,466	2,785	2,715	2,806	2,817
BHC: national total	n.d.	2,772	2,875	2,791	2,846	2,882
BHC: sample coverage	n.d.	89.0	96.9	97.3	98.6	97.8

^ The total is given by the sum of the following categories: BHC + Independent bank + Mutual banks
This table reports the number of banks and total asset for the BHCs group, both in the sample and in the population, and the whole Italian banking system for each calendar year. Sample coverage of the BHCs group is provided. Source: Bank of Italy – Annual Reports and ABI Banking Data data set.

Table 3 Summary statistics for all bank holding companies, on average over the period 2006-2011

	Obs	mean	min	p25	p50	p75	max	sd
Performance Measure								
ROA	308	0.007	-0.044	0.003	0.007	0.011	0.058	0.009
SHROA	306	1.558	-2.368	0.686	1.440	2.489	6.106	1.423
Z-SCORE	308	21.228	1.642	12.792	18.743	29.116	62.756	11.523
Revenue diversification								
TRAD_TOP	308	0.775	0.108	0.774	0.859	0.903	1.000	0.222
NON_TOP	308	0.225	0.000	0.097	0.141	0.226	0.892	0.222
MKT_TOP	308	0.054	0.000	0.018	0.029	0.049	0.558	0.080
AM_TOP	308	0.062	0.000	0.001	0.012	0.045	0.758	0.133
DIS_TOP	308	0.043	0.000	0.006	0.016	0.036	0.813	0.104
OPFIN_TOP	308	0.066	0.000	0.024	0.048	0.085	0.455	0.067
Control variables								
Total Assets								
[000]	308	49,906,828	72,968	3,011,750	7,139,615	26,200,000	1,045,611,549	153,666,188
SIZE	308	15.932	11.198	14.918	15.781	17.082	20.768	1.801
SIZE_SQ	308	257.067	125.390	222.547	249.041	291.791	431.304	58.432
COST_INCOME	308	0.682	0.193	0.584	0.654	0.729	2.616	0.227
E_TA	308	0.127	0.000	0.098	0.110	0.129	1.421	0.090
LOAN	308	0.664	0.039	0.604	0.727	0.798	0.990	0.213
GROWTH	308	0.070	-0.260	0.000	0.037	0.116	0.963	0.142
LTDB	308	0.928	0.333	0.879	0.946	1.004	3.008	0.192
NPL	308	0.012	0.000	0.004	0.011	0.017	0.098	0.012
LLP	308	-0.007	-0.039	-0.009	-0.006	-0.003	0.002	0.006
GDP_INDEX	308	0.070	-0.931	-0.110	-0.004	0.046	9.172	0.837

For a definition of the variables, see Table 1.

Table 4 Non-traditional income components: descriptive statistics average 2006-2011

	MKT_NON	AM_NON	DIS_NON	OPFIN_NON	TBC_COM	TBC_TRADT
Obs	308	308	308	308	308	308
mean	25.1%	16.7%	18.6%	39.3%	54.6%	15.2%
min	0.0%	0.0%	0.0%	0.0%	0.4%	0.1%
p25	12.7%	0.6%	5.5%	19.2%	43.4%	8.4%
p50	24.4%	10.6%	11.6%	37.5%	59.9%	13.7%
p75	35.7%	25.5%	23.0%	53.5%	72.3%	18.7%
max	97.1%	89.1%	96.8%	100.0%	100.0%	88.6%
sd	0.178	0.187	0.211	0.262	0.261	0.113

NON: Total non traditional income (MKT + AM + DIS + OPFIN)
COM: Total fees and commissions (TBC + MKT + AM + DIS)
TRADT: Total income from traditional activities (Gross interest + TBC)
Source: our xcomputation on ABI Banking Data.

Table 5 Traditional vs Non-traditional income, performance and risk [All banks in the sample]

This table reports the results of a panel data regression fixed effect. Regression coefficients are reported with standard error in parenthesis. The dependent variables are ROA (1-3); SHROA (4-6) and Z-SCORE (7-9). No interaction effect (1, 4, 7). Size interaction effect (2, 5, 8). Leverage ratio interaction effect (3, 6, 9). NON_TOP measure the share of non-traditional income on total operating revenue. The following bank specific control are included in the regression: SIZE is the natural logarithm of Total Asset in thousands of euro, SIZE_SQ is the squared term of SIZE, COST_INCOME is the ratio between personnel and other administrative expenses over intermediation margin, E_TA is the ratio of equity to total asset, LOAN is the ratio of total loans to total asset, GROWTH is the growth rate of bank total asset, LTDB is the ratio between Loans and the sum of deposits and bonds, NPL is the ratio of total net non performing loans over total net loans, LLP is the ratio of loan loss provisions to net loans,. Two macroeconomic controls are included as follows; GDP_INDEX is the annual growth rate of GDP weighted for branches and provinces and BREAK a dummy variable equals to zero for the years 2006, 2007 and 2008 and equals to one otherwise (2009, 2010 and 2011). For a definition of the variables, see Table 1. The observation period is 1996–2011.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	ROA	ROA	ROA	SHROA	SHROA	SHROA	Z-SCORE	Z-SCORE	Z-SCORE
Constant	-0.118	-0.120	-0.033	3.619	11.833	2.032	-84.890**	-83.693**	-218.992***
	(0.086)	(0.085)	(0.088)	(15.110)	(15.515)	(15.395)	(38.560)	(37.894)	(28.992)
NON_TOP	0.026***	0.158***	0.014*	2.298***	-11.427*	2.561***	3.017	-66.781***	22.287***
	(0.007)	(0.051)	(0.008)	(0.826)	(6.644)	(0.951)	(2.998)	(22.797)	(2.495)
NON_TOP x SIZE		-0.01***			0.922**			4.733***	
		(0.003)			(0.443)			(1.533)	
NON_TOP x E_TA			0.145***			-3.209			-230.161***
			(0.046)			(5.728)			(15.201)
SIZE	0.020*	0.019*	0.012	1.790	0.978	1.941	14.318***	14.964***	27.603***
	(0.011)	(0.011)	(0.011)	(1.842)	(1.871)	(1.865)	(4.899)	(4.819)	(3.615)
SIZE_SQ	-0.001**	-0.001*	-0.001	-0.111*	-0.093	-0.115**	-0.517***	-0.563***	-0.848***
	(0.000)	(0.000)	(0.000)	(0.057)	(0.057)	(0.058)	(0.162)	(0.160)	(0.118)
COST_INCOME	-0.01***	-0.01***	-0.012***	-1.677***	-1.786***	-1.686***	-0.741	-1.258	-1.393**
	(0.002)	(0.002)	(0.002)	(0.231)	(0.235)	(0.232)	(0.858)	(0.859)	(0.616)
E_TA	0.037*	0.032	-0.044	2.242	2.602	4.027	136.140***	138.708***	264.437***
	(0.022)	(0.021)	(0.033)	(2.616)	(2.603)	(4.125)	(9.698)	(9.567)	(10.955)
LOAN	-0.02***	-0.014**	-0.013**	-0.926	-1.091	-1.015	7.462***	5.676**	0.655
	(0.006)	(0.006)	(0.006)	(0.762)	(0.761)	(0.779)	(2.669)	(2.686)	(1.963)
GROWTH	-0.001	-0.000	-0.000	0.596*	0.641**	0.587*	-0.703	-0.756	-1.452*
	(0.003)	(0.003)	(0.003)	(0.324)	(0.322)	(0.325)	(1.155)	(1.135)	(0.828)
LTDB	0.009***	0.007**	0.007**	-0.098	-0.012	-0.066	-5.801***	-4.934***	-3.267***
	(0.003)	(0.003)	(0.003)	(0.393)	(0.393)	(0.398)	(1.401)	(1.406)	(1.017)
NPL	-0.020	-0.016	-0.024	-14.168**	-13.892**	-14.055**	-46.596**	-48.475**	-39.820**
	(0.049)	(0.048)	(0.048)	(5.981)	(5.941)	(5.993)	(21.964)	(21.593)	(15.731)
LLP	0.563***	0.568***	0.556***	66.769***	65.842***	66.920***	24.015	21.373	35.562
	(0.086)	(0.085)	(0.084)	(10.420)	(10.358)	(10.439)	(38.689)	(38.028)	(27.709)
GDP_INDEX	-0.000	-0.000	-0.000	-0.066	-0.049	-0.067	-0.004	0.070	-0.072
	(0.000)	(0.000)	(0.000)	(0.053)	(0.053)	(0.053)	(0.195)	(0.194)	(0.140)
BREAK	-0.002**	-0.002**	-0.002**	-0.326***	-0.317**	-0.329***	-0.890*	-0.866*	-1.091***
	(0.001)	(0.001)	(0.001)	(0.123)	(0.122)	(0.123)	(0.457)	(0.449)	(0.328)
Observations	308	308	308	306	306	306	308	308	308
R-squared	0.517	0.531	0.536	0.625	0.632	0.626	0.670	0.683	0.831
Adj. R-squared	0.383	0.397	0.404	0.520	0.526	0.518	0.578	0.592	0.784
F-statistic	21.44***	20.78***	21.27***	33.10***	31.31***	30.49***	40.58***	39.53***	90.72***

***, **, * indicates statistical significance at the 1%, 5% and 10% respectively

Table 6 Diversification between business lines, performance and risk [All banks in the sample]

This table reports the results of a panel data regression fixed effect. Regression coefficients are reported with standard error in parenthesis. The dependent variables are ROA (1-3); SHROA (4-6) and Z-SCORE (7-9). No interaction effect (1, 4, 7). Size interaction effect (2, 5, 8). Leverage ratio interaction effect (3, 6, 9). MKT_TOP, AM_TOP, DIS_TOP and OPFIN_TOP measure respectively, the share of market and trading commission, asset management commission, commission and fee from the distribution of third party product and net results from financial operations in total non-traditional revenues. The following bank specific control are included in the regression: SIZE is the natural logarithm of Total Asset in thousands of euro, SIZE_SQ is the squared term of SIZE, COST_INCOME is the ratio between personnel and other administrative expenses over intermediation margin, E_TA is the ratio of equity to total asset, LOAN is the ratio of total loans to total asset, GROWTH is the growth rate of bank total asset, LTDB is the ratio between Loans and the sum of deposits and bonds, NPL is the ratio of total net non-performing loans over total net loans, LLP is the ratio of loan loss provisions to net loans,. Two macroeconomic controls are included as follows; GDP_INDEX is the annual growth rate of GDP weighted for branches and provinces and BREAK a dummy variable equals to zero for the years 2006, 2007 and 2008 and equals to one otherwise (2009, 2010 and 2011). For a definition of the variables, see Table 1. The observation period is 1996–2011.

VARIABLES	(1) ROA	(2) ROA	(3) ROA	(4) SHROA	(5) SHROA	(6) SHROA	(7) Z-SCORE	(8) Z-SCORE	(9) Z-SCORE
Constant	-0.186**	-0.29***	-0.204**	4.959	3.235	1.095	-86.977**	-51.637	-233.7***
	(0.084)	(0.085)	(0.081)	(15.515)	(16.215)	(15.782)	(40.152)	(41.638)	(30.127)
MKT_TOP	0.013	0.362***	0.006	2.296*	-3.331	2.333	3.141	-107.76***	22.528***
	(0.009)	(0.082)	(0.012)	(1.205)	(11.575)	(1.659)	(4.419)	(40.054)	(4.355)
AM_TOP	0.021**	-0.039	-0.014	3.383**	-34.68***	4.048**	-1.739	-149.77***	12.005**
	(0.010)	(0.075)	(0.013)	(1.349)	(10.035)	(1.873)	(4.991)	(36.687)	(4.930)
DIS_TOP	0.052***	0.377***	-0.09***	3.172**	-3.219	-5.694*	1.210	-163.99***	11.037
	(0.011)	(0.116)	(0.024)	(1.464)	(15.680)	(3.336)	(5.412)	(56.905)	(8.824)
OPFIN_TOP	0.033***	0.157***	0.035***	1.784*	-0.030	1.197	5.043	-13.139	30.024***
	(0.007)	(0.060)	(0.011)	(0.985)	(8.680)	(1.549)	(3.508)	(29.201)	(4.003)
MKT_TOP x SIZE		-0.03***			0.335			7.611***	
		(0.006)			(0.805)			(2.802)	
AM_TOP x SIZE		0.005			2.603***			10.006***	
		(0.005)			(0.677)			(2.478)	
DIS_TOP x SIZE		-0.02***			0.321			11.511***	
		(0.009)			(1.147)			(4.165)	
OPFIN_TOP x SIZE		-0.009**			0.098			1.264	
		(0.004)			(0.576)			(1.962)	
MKT_TOP x E_TA			0.057			-2.027			-277.9***
			(0.069)			(9.666)			(25.580)
AM_TOP x E_TA			0.298***			-8.408			-163.3***
			(0.080)			(11.325)			(29.790)
DIS_TOP x E_TA			1.017***			57.578***			-152.2***
			(0.147)			(20.726)			(54.869)
OPFIN_TOP x E_TA			-0.057			3.656			-312.6***
			(0.098)			(13.876)			(36.650)
SIZE	0.027**	0.040***	0.033***	1.570	1.853	2.132	14.733***	10.538**	29.664***
	(0.010)	(0.011)	(0.010)	(1.888)	(1.967)	(1.913)	(5.025)	(5.267)	(3.726)
SIZE_SQ	-0.01***	-0.01***	-0.01***	-0.103*	-0.115*	-0.122**	-0.534***	-0.420**	-0.919***
	(0.000)	(0.000)	(0.000)	(0.058)	(0.061)	(0.059)	(0.165)	(0.173)	(0.121)
COST_INCOME	-0.01***	-0.01***	-0.01***	-1.644***	-1.669***	-1.591***	-0.863	-1.217	-1.648***
	(0.002)	(0.002)	(0.002)	(0.235)	(0.235)	(0.235)	(0.871)	(0.858)	(0.623)
E_TA	0.046**	0.042**	-0.026	1.967	3.680	3.122	138.010***	145.899***	268.92***
	(0.021)	(0.020)	(0.030)	(2.680)	(2.698)	(4.200)	(9.898)	(9.879)	(11.103)
LOAN	-0.012**	-0.007	-0.014**	-0.917	-0.761	-1.557*	8.072***	8.192***	-0.268
	(0.006)	(0.006)	(0.006)	(0.782)	(0.773)	(0.876)	(2.747)	(2.777)	(2.235)
GROWTH	-0.000	-0.000	0.001	0.611*	0.454	0.636*	-0.666	-1.399	-1.050
	(0.002)	(0.002)	(0.002)	(0.326)	(0.330)	(0.325)	(1.158)	(1.145)	(0.829)

LTDB	0.010***	0.007**	0.008*	-0.054	-0.002	0.082	-6.171***	-5.423***	-2.147
	(0.003)	(0.003)	(0.004)	(0.418)	(0.410)	(0.594)	(1.507)	(1.481)	(1.548)
NPL	-0.023	-0.023	-0.048	-13.602**	-13.668**	-15.131**	-47.889**	-46.155**	-42.23***
	(0.046)	(0.044)	(0.042)	(6.035)	(5.893)	(5.987)	(22.059)	(21.334)	(15.631)
LLP	0.585***	0.630***	0.665***	65.053***	66.246***	72.504***	30.600	17.544	45.185
	(0.082)	(0.078)	(0.076)	(10.618)	(10.477)	(10.748)	(39.245)	(38.325)	(28.396)
GDP_INDEX	-0.000	-0.000	-0.000	-0.068	-0.078	-0.073	0.009	0.076	-0.065
	(0.000)	(0.000)	(0.000)	(0.053)	(0.053)	(0.052)	(0.196)	(0.194)	(0.138)
BREAK	-0.002**	-0.001	-0.001	-0.345***	-0.290**	-0.249*	-0.835*	-1.047**	-0.874**
	(0.001)	(0.001)	(0.001)	(0.126)	(0.128)	(0.131)	(0.468)	(0.470)	(0.345)
Hypotheses testing[a]									
β1-β2=0	0.54	19.13***	1.21	0.58	6.07**	0.46	0.87	0.88	2.55
β1-β3=0	10.93***	0.01	14.05***	2.96**	0.00	5.36**	0.26	0.76	1.57
β1-β4=0	4.76**	4.85**	4.18**	0.19	0.07	0.33	0.20	4.35**	2.05
β2-β3=0	25.46***	12.83***	9.94***	0.07	4.05**	8.88***	0.99	0.06	0.01
β2-β4=0	0.95	4.48**	6.93***	1.05	7.32***	1.17	1.43	9.03***	6.97***
β3-β4=0	2.55*	3.53*	25.35***	0.74	0.04	4.12**	0.42	6.92***	4.49**
Observations	308	308	308	306	306	306	308	308	308
R-squared	0.576	0.629	0.659	0.627	0.651	0.643	0.673	0.701	0.840
Adj. R-squared	0.451	0.511	0.551	0.516	0.539	0.528	0.576	0.606	0.790
F-statistic	21.49***	20.80***	23.70***	26.33***	22.69***	21.87***	32.48***	28.71***	64.54***

***, **, * indicates statistical significance at the 1%, 5% and 10% respectively.

[a]: Wald Test for the joint significance of the coefficients. This statistic is distributed as a Chi-square with 2 degrees of freedom.

Table 6 Robustness check Different performance measures

This table reports the results of a panel data regression fixed effect. Regression coefficients are reported with standard error in parenthesis. The dependent variables are ROE (1-2); SHROE (3-4). NON_TOP measure the share of non-traditional income on total operating revenue. The following bank specific control are included in the regression: SIZE is the natural logarithm of Total Asset in thousands of euro, SIZE_SQ is the squared term of SIZE, COST_INCOME is the ratio between personnel and other administrative expenses over intermediation margin, E_TA is the ratio of equity to total asset, LOAN is the ratio of total loans to total asset, GROWTH is the growth rate of bank total asset, LTDB is the ratio between Loans and the sum of deposits and bonds, NPL is the ratio of total net non performing loans over total net loans, LLP is the ratio of loan loss provisions to net loans,. Two macroeconomic controls are included as follows; GDP_INDEX is the annual growth rate of GDP weighted for branches and provinces and BREAK a dummy variable equals to zero for the years 2006, 2007 and 2008 and equals to one otherwise (2009, 2010 and 2011). For a definition of the variables, see Table 1. The observation period is 1996–2011.

VARIABLES	ROE	ROE	SHROE	SHROE
Constant	-1.664	-1.735	15.432	15.711
	(1.152)	(1.202)	(18.052)	(18.501)
NON_TOP	0.150*		1.811*	
	(0.090)		(0.987)	
MKT_TOP		0.074		2.827*
		(0.132)		(1.437)
AM_TOP		0.204*		2.928*
		(0.149)		(1.609)
DIS_TOP		0.235*		2.692*
		(0.162)		(1.745)
OPFIN_TOP		0.148*		1.027
		(0.105)		(1.174)
SIZE	0.261*	0.265*	-0.271	-0.383
	(0.146)	(0.150)	(2.201)	(2.251)
SIZE_SQ	-0.009*	-0.009*	-0.030	-0.024
	(0.005)	(0.005)	(0.068)	(0.070)
COST_INCOME	-0.191***	-0.189***	-1.453***	-1.408***
	(0.026)	(0.026)	(0.276)	(0.280)
E_TA	-0.095	-0.116	-4.938	-4.887
	(0.290)	(0.296)	(3.125)	(3.196)
LOAN	-0.004	-0.003	-1.029	-0.964
	(0.080)	(0.082)	(0.910)	(0.932)
GROWTH	0.062*	0.063*	0.588	0.595
	(0.035)	(0.035)	(0.387)	(0.388)
LTDB	0.074*	0.088*	0.434	0.332
	(0.042)	(0.045)	(0.470)	(0.499)
NPL	-0.429	-0.430	-10.080	-9.214
	(0.656)	(0.661)	(7.146)	(7.196)
LLP	4.787***	4.788***	49.297***	46.568***
	(1.156)	(1.175)	(12.449)	(12.661)
GDP_INDEX	0.005	0.005	0.024	0.020
	(0.006)	(0.006)	(0.063)	(0.063)
BREAK	-0.027**	-0.027*	-0.493***	-0.529***
	(0.014)	(0.014)	(0.147)	(0.150)
Observations	308	308	306	306
R-squared	0.386	0.389	0.470	0.474
Adj. R-squared	0.215	0.209	0.321	0.318
F-statistic	12.60	10.07	17.59	14.14

***, **, * indicates statistical significance at the 1%, 5% and 10% respectively

Table 7 Robustness check Endogeneity and selectivity Issues

The table shows regression results for the regression of banks' performance on a set of explanatory variables, including a proxy for the degree of diversification as robustness tests of our results in Table 5 (Columns 1-4-7). The estimation technique is Heckman (1979) treatment effects model by maximum likelihood. The first row denotes the dependent variable. DIVERSIFIED is a dummy variable that indicates whether a firm is diversified or not. The dummy equals one, if the ratio of non traditional income over total operating income exceeds 22.61%, i.e. the 75% quantile of the empirical distribution. The following bank specific control are included in the regression: SIZE is the natural logarithm of Total Asset in thousands of euro, SIZE_SQ is the squared term of SIZE, COST_INCOME is the ratio between personnel and other administrative expenses over intermediation margin, E_TA is the ratio of equity to total asset, LOAN is the ratio of total loans to total asset, GROWTH is the growth rate of bank total asset, LTDB is the ratio between Loans and the sum of deposits and bonds, NPL is the ratio of total net non performing loans over total net loans, LLP is the ratio of loan loss provisions to net loans. One macroeconomic control is included: BREAK a dummy variable equals to zero for the years 2006, 2007 and 2008 and equals to one otherwise (2009, 2010 and 2011). For a definition of the variables, see Table 1. The observation period is 1996–2011.

VARIABLES	ROA	SHROA	Z-Score
Constant	-0.012	-7.985**	-57.159**
	(0.020)	(3.785)	(29.119)
DIVERSIFIED	0.002	0.973**	-10.749**
	(0.002)	(0.416)	(5.432)
SIZE	0.005*	1.399***	7.436**
	(0.002)	(0.461)	(3.518)
SIZE_SQ	-0.000**	-0.042***	-0.186*
	(0.000)	(0.014)	(0.107)
COST_INCOME	-0.019***	-2.526***	-3.690
	(0.002)	(0.291)	(2.381)
E_TA	0.055***	4.744***	107.662***
	(0.008)	(1.376)	(11.422)
LOAN	-0.004	1.108**	18.681***
	(0.003)	(0.457)	(3.857)
LTDB	0.001	-0.672	-7.530**
	(0.003)	(0.427)	(3.671)
NPL	-0.056*	-8.639	75.618
	(0.034)	(6.016)	(48.952)
LLP	0.469***	84.660***	404.139***
	(0.064)	(11.405)	(93.138)
BREAK	-0.002***	-0.588***	-0.896
	(0.001)	(0.135)	(1.116)
Simultaneous probit estimation (diversified as dependant)			
Constant	-0.590***	-0.608***	-0.596***
	(0.087)	(0.085)	(0.088)
GROWTH	-1.277**	-0.970*	-1.240**
	(0.615)	(0.569)	(0.617)
GDP_INDEX	-0.386	-0.412*	-0.341
	(0.253)	(0.243)	(0.244)
LR-test of independent equations	0.07	2.97	0.35

***, **, * indicates statistical significance at the 1%, 5% and 10% respectively